2.39.1. Indirect Deduction Problems

A. Show that each of the following formal arguments is valid by constructing an **indirect deduction** for it.

1. $\sim P \therefore \sim(P \wedge Q)$

2. $(P \vee R) \cdot (Q \vee R) \cdot (\sim P \vee \sim Q) \therefore R$

3. $\sim(P \wedge Q) \cdot (R \vee Q) \cdot \sim R \therefore \sim P$

4. $(P \vee Q) \cdot (R \vee Q) \cdot \sim(P \wedge R) \therefore Q$

5. $\sim(P \vee Q) \cdot (P \vee R) \therefore R$

6. $(T \vee \sim(P \wedge Q)) \cdot (Q \vee \sim(R \wedge S)) \cdot (R \vee \sim S) \cdot (\sim T \wedge S) \therefore \sim P$

B. **Translate** each of the following arguments into the formal language; then show that the argument is valid by constructing a **deduction** for it.

1. Letitia won't get an A unless she's a genius who doesn't need to study. Letitia needs to study. ∴ Letitia won't get an A.

2. Jake didn't study yet not pass the exam. Jake didn't pass the exam. ∴ Jake neither studied nor passed the exam. (*See 2.9.1 §4 on the effect of deleted repetition on scope and negation.*)

3. Either Jimmy cracked corn and someone's in the kitchen with Dinah, or she'll be coming 'round the mountain. Unless she'll be coming 'round the mountain, I don't care. She won't be coming 'round the mountain.
∴ Jimmy cracked corn and I don't care.

4. Suki’s getting good grades unless she’s not studying. Unless she’s getting good grades, Suki’s not enjoying college. Suki’s either studying or enjoying college. ∴ Suki’s getting good grades.

Adapted from Kalish and Montague 1964: 30 #20

5. Unless Trixie won the poker championship, we’re not having both mochi and mangos. Either we’re not having mangos or we’re having margaritas. We’re having mochi unless we’re not having margaritas. We are having mangos. ∴ Trixie won the poker championship.

6. Either both Neko and Jack are going to Logicpalooza, or Barbie isn’t. Neko isn’t going to Logicpalooza, but either Jack or Barbie is. ∴ Jack’s going to Logicpalooza.

7. Both Suki and Neko ate dinner. ∴ Either Suki ate dinner and Jack did too, or Neko ate dinner but Jack didn’t.

8. Either I’m crazy, or Jake has lost weight. Jake hasn’t both lost weight and practiced for the sushi-eating contest. Unless Jake has practiced for the sushi-eating contest, Neko will win the prize again this year and Jake will be depressed for a week. Although I’m not normal, I’m not crazy. ∴ Jake will be depressed for a week.

9. Letitia won’t be happy unless she beats Dr. Slim at checkers. Letitia and Lucretia won’t both beat Dr. Slim at checkers. Either Lucretia will beat Dr. Slim at checkers and Dr. Slim will beat Letitia at gin rummy, or Lucretia and Letitia will both beat Dr. Slim at checkers and Dr. Slim will beat Lucretia at gin rummy. ∴ Dr. Slim will beat Letitia at gin rummy, and she won’t be happy.

(*Hint: deduce each half of the conjunction separately.*)

10. Neither Kitty nor Dr. Slim has either a law degree or a medical license. ∴ Neither Kitty nor Dr. Slim has both a law degree and a medical license.